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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the antenna which added the circuit to which antenna tuning frequency is changed especially about the reverse F type antenna carried in a walkie-talkie terminal.

[0002]

[Description of the Prior Art] Drawing 5 is the perspective diagram showing the outline of the antenna with built-in reverse F type currently used for the conventional walkie-talkie terminal, and drawing 6 is the example view of a reflection property. For a grounding plate and 3, in drawing, an electric supply cable and 4 are [ 1 / a radiation plate and 2 / an electric supply pin and a of a short circuit pin and 5 ] the feeding points. Conventionally a low profile flat antenna as shown in drawing 5 is used, and tuning-frequency bandwidth (ratio band) is about several % used as -10dB or less with which return loss is satisfied of voltage standing wave ratio (V. S.W.R.) <2.0 predetermined. In drawing 6, it is 2%.

[0003] Drawing 7 is the example view of allocation of a frequency band. In recent years, a walkie-talkie terminal has come to spread quickly with expansion of service areas, such as a cellular phone, low-pricing of a terminal, and reduction of telephone call cost. In connection with it, additional assignment of the radio channel may have came to be carried out at the frequency band B which required radio channels ran short, for example, is separated from the frequency band A present in use like the A bands of drawing 7, and B band.

[0004] Although there is additional allocation of a radio channel with spoiling an antenna property and it can respond if it is the frequency band which followed the frequency band present in use, and no realizes wide band-ization of an antenna, when additional allocation is carried out at the frequency band sharply left like the band B of drawing 7, only by wide band-ization of an antenna, antenna gain deteriorates and there is a problem that a good antenna property cannot be acquired. Moreover, even when wide band-ization of an antenna was not performed and a band was changed, the mismatching loss (mismatch loss) was produced without obtaining a good impedance characteristic, and there was a problem that antenna gain was spoiled.

[0005] In order to solve the trouble of such conventional technology, the applicant for this patent proposed previously the antenna for walkie-talkie terminals which can give an antenna property with good either of the frequency band left mutually (refer to Japanese Patent Application No. No. 273939 [ eight to ]).

[0006] Drawing 8 is the perspective diagram showing the structure of the antenna proposed previously, and is the example of structure of the antenna for walkie-talkie terminals which connected in series the in-series variable-capacity circuit 7 which consists of a bias control circuit to which variable capacitance diode and its capacity are changed between the electric supply pin 5 and the electric supply cable 3 to a receiver input. The grounding plates 2, such as the radiation plate 1 and a substrate, and the short circuit pin 4 are considered as the basic composition of an antenna, and the feeding point a is connected to the receiver input by the electric supply pin 5, the in-series variable-capacity circuit 7 to which antenna tuning frequency is changed, and the electric supply cable 3.

[0007] Drawing 9 is the example view of circuitry of the antenna of drawing 8. By impressing a control voltage Vcont to variable-capacitance-diode CR10, in-series static capacity value is changed and it is the resonance frequency f0 of an antenna. It is constituted so that it can control arbitrarily. However, by this example, although the electric merit D of the radiation plate 1 (=W+L) is set as about 1/4 of the wavelength lambda of desired frequency with the built-in antenna of the usual end machine of the non-end of line, since adjustment is taken with in-series electrostatic capacity, a walkie-talkie input-side impedance and an antenna impedance are resonated on frequency higher than desired frequency. That is, the antenna electrical-and-electric-equipment length D is set up shorter than the quadrant of wavelength lambda. Moreover, the position of the antenna feeding point a of the radiation plate 1 is set to a position by the capacity value of variable-capacitance-diode CR10 to be used.

[0008] Drawing 10 is the example view of a reflection property which saw the antenna circuit when controlling the bias voltage of variable-capacitance-diode CR10, and changing capacity value, and a vertical axis shows return loss. With the curve c which a control voltage Vcont is high and is resonating on low frequency in the curve g which is resonating on the highest frequency, a control voltage Vcont is low. In this example, only the 0.68pF of the whole capacity value was changed by variable-capacitance-diode CR10 and the capacitor C1. The resonance characteristic changes like curvilinear c-g by this, and it turns out that the adjustable width of face of resonance frequency is about 100MHz. In practice, since there should just be adjustable width of face of about dozens of MHz, 100MHz can be called sufficient variation. Moreover, since it considers as high resistance (kohm grade) since a circuit side is not affected, and the capacitor C2 is formed as a RF path capacitor, bias resistance R1 is large capacity value.

[0009]

[Problem(s) to be Solved by the Invention] However, with the composition proposed at the above-mentioned point, when it is made to change to low frequency as shown in drawing 10, alignment adjustment bandwidth becomes narrow, or there is a problem that frequency adjustable width of face may be unable to take sufficiently widely. Moreover, since a variable capacitance diode (variable capacitance diode) has dispersion in a performance, it has the problem that the amount of frequency control varies.

[0010] The purpose of this invention is to offer the antenna for walkie-talkie terminals which can give an antenna property with good either of the frequency band left mutually without solving the point that alignment adjustment bandwidth becomes narrow and using a variable capacitance diode, when the point and frequency which are a narrow-band are changed in the antenna simple substance which is the trouble of composition of having proposed at the above place.

[0011]

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[Means for Solving the Problem] The radiation plate which the antenna for walkie-talkie terminals of this invention countered the grounding plate and this grounding plate, and has been arranged in parallel, In the antenna for walkie-talkie terminals of reverse F type which consisted of a short circuit pin which short-circuits one end part and aforementioned grounding plate of this radiation plate, and an electric supply cable connected to the feeding point of the position of the side edge section of the aforementioned radiation plate through the electric supply pin Between the aforementioned electric supply pin and the aforementioned electric supply cable The impedance matching circuit by the reverse L form capacitive reactance which consists of a parallel capacitor which the end was connected to the aforementioned electric supply pin side, and was connected between the terminal by the side of this electric supply cable of the series capacitor by which the other end was connected to the aforementioned electric supply cable side, and this series capacitor, and grounding, The 1st switching diode by which parallel connection was carried out to the aforementioned series capacitor, The 2nd switching diode connected to the aforementioned parallel capacitor and the serial, Control each bias voltage of the 1st switching diode of the above, and the 2nd switching diode, become, change from ON / the 1st for turning off, and the 2nd bias voltage control circuit, and insertion connection of the matching circuit is made. When the 1st switching diode of the above is turned ON and the 2nd switching diode of the above is turned OFF, the aforementioned series capacitor connects too hastily and it aligns with the 1st frequency band to which the aforementioned parallel capacitor was assigned by being opened. When the 1st switching diode of the above is turned OFF and the 2nd switching diode of the above is turned ON It is characterized by for the aforementioned impedance matching circuit having changed into the state where insertion connection was made, and being constituted so that it may align with the 2nd frequency band which separated with the 1st frequency band of the above, and was assigned.

[0012]

[Embodiments of the Invention] In order to attain the above-mentioned purpose, this invention between the feeding point of the flat antenna for walkie-talkie terminals, and an electric supply cable The reverse L form capacitive reactance matching circuit which consists of a series capacitor C6 for impedance matching, and a parallel capacitor C5 during opposite grounding, The 1st switching diode CR 1 connected in parallel with a series capacitor C6 The 2nd switching diode CR 2 connected with the parallel capacitor C5 in series By [ which consist of a bias-current control circuit of two switching diodes ] changing, making insertion connection of the matching circuit, and turning on / turning off two switching diodes by turns By inserting the reverse L form matching circuit of capacitors C5 and C6, or carrying out short circuit opening, and changing, it is characterized by constituting either of two left frequency bands so that an antenna may resonate.

[0013] Hereafter, it explains based on an example. The perspective diagram of the example of this invention is shown in drawing 1 . It is the perspective diagram of the antenna for field radios which connected in series the reverse L form capacitive reactance matching circuit by capacitors C5 and C6, and the change matching circuit 6 containing two switching diodes which perform the enter end between the electric supply pin 5 and the electric supply cable 3.

[0014] Drawing 2 is the example view of a circuit of the antenna of this invention shown in drawing 1 . In drawing, R1-R3 are bias resistance, and since they do not affect a RF property, they are high resistance (several kohms or more). Capacitors C1-C4 are RF path capacitors, and are large capacity value. Capacitors C5 and C6 are capacitors for adjustment, and constitute a reverse L form capacitive reactance matching circuit. For example, they are C6=10pF and C5=5pF. When one side is turned ON by impressing control voltages Vcont1 and Vcont2 to switching diodes CR1 and CR2, another side is turned OFF, and as shown in drawing 3 (A) or this drawing (B), the enter end of the matching circuit of capacitors C5 and C6 is changed.

[0015] It is a high-frequency equivalent circuit when drawing 3 (A) set the control voltage to Vcont1=3V and Vcont2=0V, and CR1 is turned ON and it turns OFF CR2, and C6 connects too hastily by the on resistance (1ohm) of CR1, C5 is opened wide, an antenna and a receiver input edge are linked directly, and it has consistency in the frequency band (A bands) of the method of a low. It is the case where drawing 3 (B) set the control voltage to Vcont1=0V and Vcont2=3V, and turned OFF CR1 and it turns ON CR2, and since C5 is connected by the on resistance (1ohm) of CR2 and the impedance matching circuit where the OFF capacity of CR1 was added in parallel with C6 is connected, it has consistency in the frequency band of the higher one. The on resistance Rs of a switching diode is fixed in 0.5-1.0ohm, and since it is performing the frequency change by the low-impedance side of an antenna under these conditions, it is low loss.

[0016] Drawing 4 is the example view of a reflection property which saw the antenna circuit when having entered the change matching circuit 6 of this invention by switching, a horizontal axis shows frequency and a vertical axis shows return loss. Even if the resonance characteristic changes from a to a from b or b and dozens of MHz resonance frequency changes from this property view, it turns out that bandwidth is the same.

[0017] In the circuit of this this invention, although two diodes are used, the diode containing one packages [ two ] can be used in fact. Moreover, a large change is not needed for the structure of the conventional reverse F type antenna so that the same thing may show the configuration of the conventional antenna of drawing 5 , and the configuration of the antenna of this invention of drawing 1 .

[0018]

[Effect of the Invention] Like the above explanation, the following effects are acquired by carrying out this invention.

- (1) Since a matching circuit can be changed and controlled to align by either of two different frequency bands, antenna property sufficient also by the left radio channel can be maintained.
- (2) The on resistance Rs of a switching diode is fixed in 0.5-1.0ohm, and since it is performing the frequency change by the low-impedance side of an antenna under these conditions, it is low loss.
- (3) Although the circuit diagram has indicated two diodes separately, since the diode containing one packages [ two ] can be used in fact, it is small.
- (4) There is no large thing to change in the structure of the conventional antenna.

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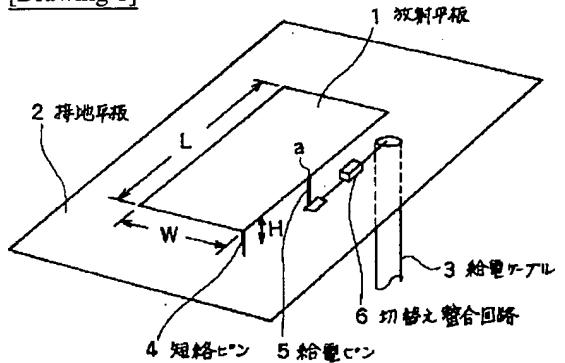
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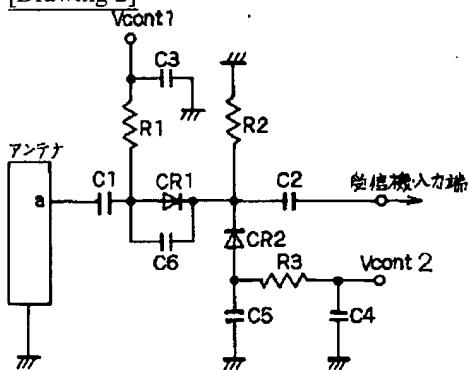
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DRAWINGS

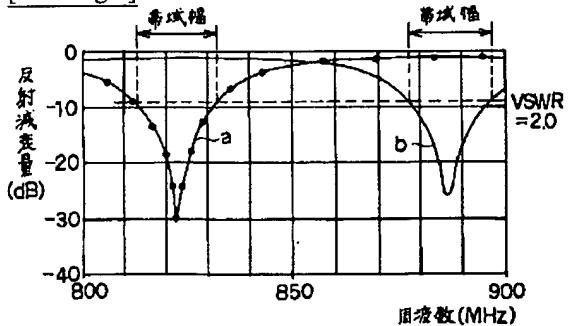
[Drawing 1]



[Drawing 2]

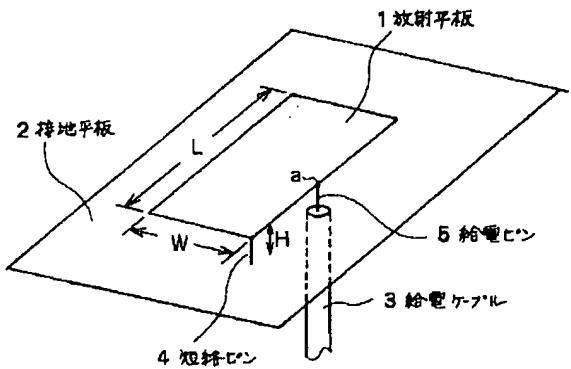


[Drawing 4]

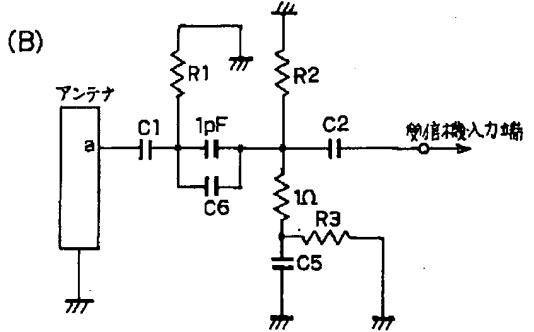
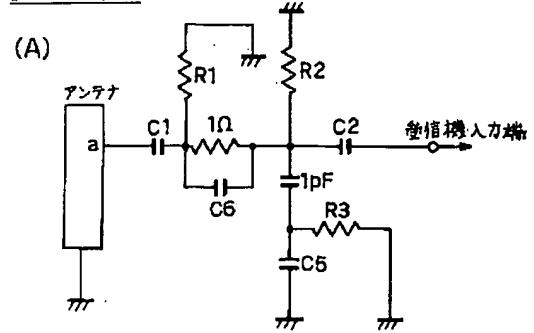


[Drawing 5]

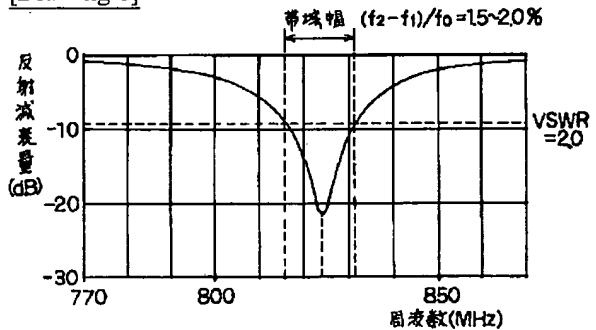
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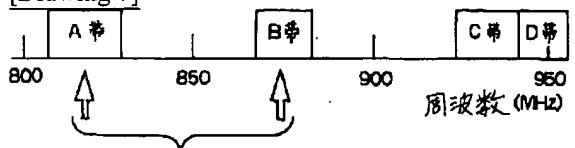
[Drawing 3]



[Drawing 6]

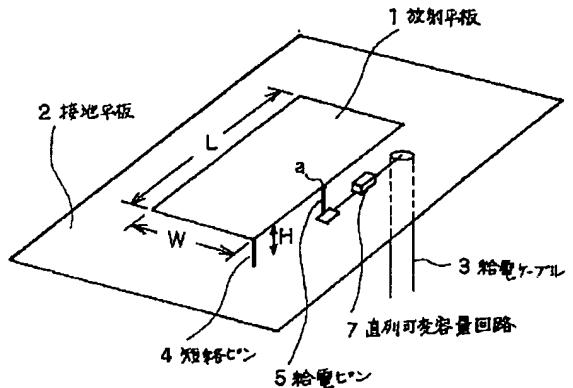


[Drawing 7]

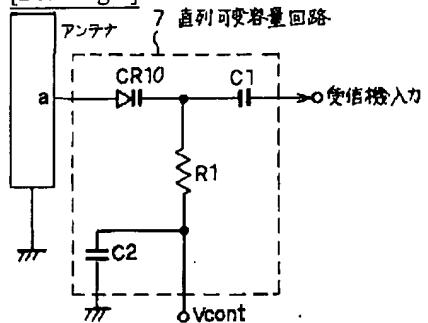


[Drawing 8]

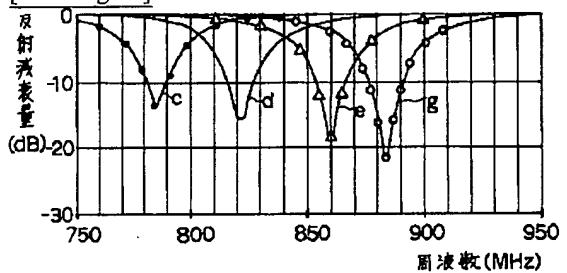
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[Drawing 9]



[Drawing 10]



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